

ABSTRACT

The present invention provides a method for enhancing uni-directional diffusion of a metal during silicidation by using a metal-containing silicon alloy in conjunction with a first anneal in which two distinct thermal cycles are performed. The first thermal cycle of the first anneal is performed at a temperature that is capable of enhancing the uni-directional diffusion of metal, e.g., Co and/or Ni, into a Si-containing layer. The first thermal cycle causes an amorphous metal-containing silicide to form. The second thermal cycle is performed at a temperature that converts the amorphous metal-containing silicide into a crystallized metal rich silicide that is substantially non-etchable as compared to the metal-containing silicon alloy layer or a pure metal-containing layer. Following the first anneal, a selective etch is performed to remove any unreacted metal-containing alloy layer from the structure. A second anneal is performed to convert the metal rich silicide phase formed by the two thermal cycles of the first anneal into a metal silicide phase that is in its lowest resistance phase. A metal silicide is provided whose thickness is self-limiting.